

What Is Claimed Is:

1. An image sensing apparatus comprising:
an image sensor which separately outputs image
5 signals of a plurality of divided areas of a plurality
of photoreceptive pixels from a plurality of output
terminals respectively corresponding to the plurality of
divided areas;
a control unit for controlling to read a reference
10 density member having a predetermined density of half
tone; and
an adjustment unit for adjusting levels of the
image signals output by said output terminals so as to
substantially correspond to a level of a predetermined
15 reference signal based on data obtained by reading said
reference density member by said image sensor.
2. The image sensing apparatus according to claim
1, wherein said adjustment unit adjusts the levels of
20 the image signals output from said output terminals
using look up tables.
3. The image sensing apparatus according to claim
1, wherein said adjustment unit adjusts the levels of
25 the image signals output from said output terminals
using operation equations.

4. The image sensing apparatus according to claim 1, wherein said adjustment unit adjusts the levels of the image signals output from said output terminals so as to substantially match to the level of the predetermined reference signal on the basis of data obtained by reading said reference density member by said image sensor while changing accumulation period.

5. The image sensing apparatus according to claim 4, wherein said adjustment unit adjusts the levels of the image signals output from said output terminals on the basis of levels obtained by subtracting dark current level output during the accumulation period which is used for reading said reference density member from the levels of the image signals output from said output terminals.

6. The image sensing apparatus according to claim 1 further comprising a shading correction unit, wherein said adjustment unit is arranged downstream to said shading correction unit.

7. The image sensing apparatus according to claim 1 further comprising a shading correction unit,

wherein said adjustment unit is arranged upstream
to said shading correction unit.

8. The image sensing apparatus according to claim
5 1 further comprising:

a shading correction unit; and

a switch for changing a processing order of said
adjustment unit and said shading correction unit.

10 9. The image sensing apparatus according to claim
1, wherein said image sensor separately outputs signals
of a right-side divided area from signals of a left-side
divided area.

15 10. The image sensing apparatus according to claim
1, wherein said image sensor is a linear image sensor.

11. The image sensing apparatus according to claim
10, wherein a plurality of said linear image sensors
20 respectively corresponding to a plurality of colors are
provided to form a color image sensor.

12. The image sensing apparatus according to claim
1, wherein said image sensor is an area image sensor
25

13. The image sensing apparatus according to claim 1, wherein said reference density member is provided within the image sensing apparatus.

5 14. The image sensing apparatus according to claim 1 further comprising a platen for placing an original to be read on it,

wherein said control unit controls said image sensor to read said reference density member in a case
10 where said reference density member is placed on said platen.

15 15. The image sensing apparatus according to claim 1, wherein the image sensing apparatus is connected to a printer and said reference density member is printed by said printer.

20 16. The image sensing apparatus according to claim 15, wherein the image sensing apparatus is integrally configured with said printer.

25 17. An image sensing method in image sensing apparatus having an image sensor which separately outputs image signals of a plurality of divided areas of a plurality of photoreceptive pixels from a plurality of output terminals respectively corresponding to the

plurality of divided areas, and a processing unit for processing the output image signals, said method comprising:

5 a reading step of reading a reference density member having a predetermined density of half tone by said image sensor;

an adjustment step of adjusting said processing unit so as to substantially correspond levels of the image signals output from said output terminals to a level of a predetermined reference signal based on data
10 obtained by reading said reference density member by said image sensor; and

an original read step of reading an original by said image sensor.

15

18. The image sensing method according to claim 17, wherein, in said adjustment step, look up tables of said processing unit are set to adjust the levels of the image signals output from said output terminals.

20

19. The image sensing method according to claim 17, wherein, in said adjustment step, operation equations in said processing unit are set to adjust the levels of the image signals output from said output terminals using
25 operation equations.

20. The image sensing method according to claim 17,
wherein, in said adjustment step, said processing unit
is adjusted so as to substantially match the levels of
the image signals output from said output terminals to
5 the level of the predetermined reference signal on the
basis of data obtained by reading said reference density
member by said image sensor while changing accumulation
period.

10 21. The image sensing method according to claim 20,
wherein, in said adjustment step, levels obtained by
subtracting dark current level output during the
accumulation period which is used for reading said
reference density member from the levels of the image
15 signals output from said output terminals are matched to
the level of the predetermined reference signal.

22. The image sensing method according to claim 17
further comprising a shading correction step,
20 wherein said adjustment step is performed after
said shading correction step.

23. The image sensing method according to claim 17
further comprising a shading correction step,
25 wherein said adjustment step is performed before
said shading correction step.

24. The image sensing method according to claim 17 further comprising:

a shading correction step; and

5 a switching step of changing a processing order of said adjustment step and said shading correction step.

25. The image sensing method according to claim 17, wherein said image sensor separately outputs signals of
10 a right-side divided area from signals of a left-side divided area.

26. The image sensing method according to claim 17, wherein said image sensor is a linear image sensor.
15

27. The image sensing method according to claim 26, wherein the image sensing apparatus has a plurality of said linear image sensors respectively corresponding to a plurality of colors to form a color image sensor.
20

28. The image sensing method according to claim 17, wherein said image sensor is an area image sensor.

29. The image sensing method according to claim 17, wherein said reference density member is provided within
25 the image sensing apparatus.

30. The image sensing method according to claim 17,
wherein the image sensing apparatus further includes a
platen for placing an original to be read on it,

5 and in said reading step, said reference density
member placed on said platen is read.

31. The image sensing method according to claim 17,
wherein the image sensing apparatus is connected to a
10 printer, and the image sensing method further comprises
a step of printing said reference density member by said
printer.

32. The image sensing method according to claim 17,
15 wherein the image sensing apparatus is integrally
configured with said printer.

33. A computer program product comprising a
computer usable medium having computer readable program
20 code means embodied in said medium for an image reading
method in image sensing apparatus having an image sensor
which separately outputs image signals of a plurality of
divided areas of a plurality of photoreceptive pixels
from a plurality of output terminals respectively
25 corresponding to the plurality of divided areas, and a

processing unit for processing the output image signals,
said product including:

first computer readable program code means for
reading a reference density member having a

5 predetermined density of half tone by said image sensor;

second computer readable program code means for
adjusting said processing unit so as to substantially
match levels of the image signals output from said
output terminals to a level of a predetermined reference
10 signal on the basis of data obtained by reading said
reference density member by said image sensor; and

third computer readable program code means for
reading an original by said image sensor.

15 34. An image sensing apparatus comprising:

an image sensor which separately outputs image
signals of a plurality of divided areas of a plurality
of photoreceptive pixels from a plurality of output
terminals respectively corresponding to the plurality of
20 divided areas;

a shading correction unit for applying shading
correction to the image signals; and

an adjustment unit for adjusting levels of the
image signals output from said output terminals so as to
25 substantially match to a level of a predetermined
reference signal.

35. An image sensing method in image sensing apparatus having an image sensor which separately outputs image signals of a plurality of divided areas of a plurality of photoreceptive pixels from a plurality of output terminals respectively corresponding to the plurality of divided areas, said method comprising:

an adjustment step of adjusting levels of the image signals output from said output terminals so as to substantially match to a level of a predetermined reference signal; and

a shading correction step of applying shading correction on said image signals adjusted in said adjustment step.

36. A computer program product comprising a computer usable medium having computer readable program code means embodied in said medium for an image sensing method in image sensing apparatus having an image sensor which separately outputs image signals of a plurality of divided areas of a plurality of photoreceptive pixels from a plurality of output terminals respectively corresponding to the plurality of divided areas, said product including:

first computer readable program code means for adjusting levels of the image signals output from said

output terminals so as to substantially match to a level
of a predetermined reference signal; and

second computer readable program code means for
applying shading correction on said adjusted image
5 signals.

37. An image sensing apparatus comprising:

an image sensor which separately outputs image
signals of a plurality of divided areas of a plurality
10 of photoreceptive pixels from a plurality of output
terminals respectively corresponding to the plurality of
divided areas;

a plurality of signal processing units,
respectively corresponding to the plurality of divided
15 areas, for applying predetermined signal processing to
the image signals output from said output terminals;

a white board;

a control unit for controlling to read a reference
density member having a predetermined density of half
20 tone; and

an adjustment data acquisition unit for acquiring
adjustment data, for the respective signal processing
units, for 1) substantially matching levels of the image
signals output from said plurality of signal processing
25 units to a first predetermined level when said white
board is scanned, 2) substantially matching levels of

the image signals output from said plurality of signal processing units to a second predetermined level when said reference density board is scanned, and 3) substantially matching levels of the image signals output from said plurality of signal processing units to a level obtained by interpolating between said first and second predetermined levels when an image having a density other than the density of said white board and said reference density board is scanned; and

10 an adjustment unit for adjusting levels of image signals output from said plurality of signal processing units using said adjustment data.

38. The image sensing apparatus according to claim 15 37, wherein said reference density member is provided within the image sensing apparatus.

39. The image sensing apparatus according to claim 37 further comprising a platen for placing an original 20 to be read on it,

wherein said control unit controls said image sensor to read said reference density member in a case where said reference density member is placed on said platen.

25

40. The image sensing apparatus according to claim 37, wherein at least one of the first and second predetermined levels is set in advance.

5 41. The image sensing apparatus according to claim 37, wherein said first predetermined level is an average of signal levels obtained from said plurality of signal processing units when said white board is scanned.

10 42. The image sensing apparatus according to claim 37, wherein said first predetermined level is a maximum of signal levels obtained from said plurality of signal processing units when said white board is scanned.

15 43. The image sensing apparatus according to claim 37, wherein said first predetermined level is a minimum of signal levels obtained from said plurality of signal processing units when said white board is scanned.

20 44. The image sensing apparatus according to claim 37, wherein said second predetermined level is an average of signal levels obtained from said plurality of signal processing units when said reference density board is scanned.

25

45. The image sensing apparatus according to claim
37, wherein said second predetermined level is a maximum
of signal levels obtained from said plurality of signal
processing units when said reference density board is
5 scanned.

46. The image sensing apparatus according to claim
37, wherein said second predetermined level is a minimum
of signal levels obtained from said plurality of signal
10 processing units when said reference density board is
scanned.

47. The image sensing apparatus according to claim
37, wherein said first predetermined level is a maximum
15 of signal levels obtained from said plurality of signal
processing units when said white board is scanned and
said second predetermined level is a minimum of signal
levels obtained from said plurality of signal processing
units when said reference density board is scanned.

20

48. The image sensing apparatus according to claim
37, wherein said adjustment data acquisition unit
acquires the adjustment data so that maximum levels of
image signals obtained from said plurality of signal
25 processing units become maximum levels after adjustment
by said adjustment unit.

49. The image sensing apparatus according to claim 37, wherein the levels between said first and second predetermined levels are interpolated by a straight line.

5

50. The image sensing apparatus according to claim 37, wherein the levels between said first and second predetermined levels are interpolated by a curve.

10 51. The image sensing apparatus according to claim 37, wherein the interpolation is performed by operation.

52. The image sensing apparatus according to claim 37, wherein said adjustment data is in a form of a look
15 up table.

53. The image sensing apparatus according to claim 37, wherein said image sensor separately outputs signals of a right-side divided area from signals of a left-side
20 divided area.

54. The image sensing apparatus according to claim 37, wherein said image sensor is a linear image sensor.

25 55. The image sensing apparatus according to claim 54, wherein a plurality of said linear image sensors

respectively corresponding to a plurality of colors are provided to form a color image sensor.

56. The image sensing apparatus according to claim
5 37, wherein said image sensor is an area image sensor.

57. The image sensing apparatus according to claim
37, wherein each of said plurality of signal processing
units includes an amplifier for amplifying the image
10 signal output from the output terminal.

58. The image sensing apparatus according to claim
37, wherein each of said plurality of signal processing
units includes an A/D converter for converting the image
15 signal output from the output terminal from an analog
signal to a digital signal.

59. The image sensing apparatus according to claim
39, wherein the image sensing apparatus is connected to
20 a printer and said reference density member is printed
by said printer.

60. The image sensing apparatus according to claim
37, wherein said reference density member has at least a
25 portion of uniform density.

61. The image sensing apparatus according to claim 59, wherein the image sensing apparatus is integrally configured with said printer.

5 62. An adjustment method of adjusting image signals in an image sensing apparatus having an image sensor which separately outputs image signals of a plurality of divided areas of a plurality of photoreceptive pixels from a plurality of output
10 terminals respectively corresponding to the plurality of divided areas, a plurality of signal processing units, respectively corresponding to the plurality of divided areas, for applying predetermined signal processing to the image signals output from said output terminals, and
15 a white board, said method comprising:

a first reading step of scanning said white board by said image sensor and outputting image signals processed by said plurality of signal processing units;

a second reading step of scanning said reference
20 density board by said image sensor and outputting image signals processed by said plurality of signal processing units;

an adjustment data acquisition step of acquiring adjustment data, for the respective signal processing
25 units, for 1) substantially matching levels of the image signals output in said first reading step to a first

predetermined level, 2) substantially matching levels of
the image signals output in said second reading step to
a second predetermined level, and 3) substantially
matching levels of the image signals output from said
5 plurality of signal processing units to a level obtained
by interpolating between said first and second
predetermined levels when an image having a density
other than the density of said white board and said
reference density board is scanned on the basis of the
10 image signals obtained in said first and second reading
steps; and

an adjustment step of adjusting levels of image
signals output from said plurality of signal processing
units using said adjustment data.

15

63. The adjustment method according to claim 62,
wherein said reference density member is provided within
the image sensing apparatus.

20 64. The adjustment method according to claim 62,
wherein the image sensing apparatus further comprises a
platen for placing an original to be read on it,

and in said second reading step, said reference
density member placed on said platen is read.

25

65. The adjustment method according to claim 62,
wherein at least one of the first and second
predetermined levels is set in advance.

5 66. The adjustment method according to claim 62
further comprising a step of calculating an average of
signal levels obtained from said plurality of signal
processing units in said first reading step as said
first predetermined level.

10

67. The adjustment method according to claim 62
further comprising a step of acquiring a maximum of
signal levels obtained from said plurality of signal
processing units in said first reading step as said
15 first predetermined level.

68. The adjustment method according to claim 62
further comprising a step of acquiring a minimum of
signal levels obtained from said plurality of signal
20 processing units in said first reading step as said
first predetermined level.

69. The adjustment method according to claim 62
further comprising a step of calculating an average of
25 signal levels obtained from said plurality of signal

processing units in said second reading step as said second predetermined level.

70. The adjustment method according to claim 62
5 further comprising a step of acquiring a maximum of signal levels obtained from said plurality of signal processing units in said second reading step as said second predetermined level.

10 71. The adjustment method according to claim 62 further comprising a step of acquiring a minimum of signal levels obtained from said plurality of signal processing units in said second reading step as said second predetermined level.

15

72. The adjustment method according to claim 62 further comprising:

a step of acquiring a maximum of signal levels obtained from said plurality of signal processing units
20 in said first reading step as said first predetermined level; and

a step of acquiring a minimum of signal levels obtained from said plurality of signal processing units in said second reading step as said second predetermined
25 level.

73. The adjustment method according to claim 62,
wherein, in said adjustment data acquisition step, the
adjustment data is acquired so that maximum levels of
image signals obtained from said plurality of signal
5 processing units become maximum levels after adjustment
by said adjustment unit.

74. The adjustment method according to claim 62,
wherein the levels between said first and second
10 predetermined levels are interpolated by a straight line.

75. The adjustment method according to claim 62,
wherein the levels between said first and second
predetermined levels are interpolated by a curve.
15

76. The adjustment method according to claim 62,
wherein the interpolation is performed by operation.

77. The adjustment method according to claim 62,
20 wherein said adjustment data is in a form of a look up
table.

78. The adjustment method according to claim 62,
wherein said image sensor separately outputs signals of
25 a right-side divided area from signals of a left-side
divided area.

79. The adjustment method according to claim 62,
wherein said image sensor is a linear image sensor.

5 80. The adjustment method according to claim 79,
wherein the image sensing apparatus a plurality of said
linear image sensors respectively corresponding to a
plurality of colors are provided to form a color image
sensor.

10

81. The adjustment method according to claim 62,
wherein said image sensor is an area image sensor.

82. The adjustment method according to claim 62,
15 wherein each of said plurality of signal processing
units includes an amplifier for amplifying the image
signal output from the output terminal.

83. The adjustment method according to claim 62,
20 wherein each of said plurality of signal processing
units includes an A/D converter for converting the image
signal output from the output terminal from an analog
signal to a digital signal.

25 84. The adjustment method according to claim 64,
wherein the image sensing apparatus is connected to a

printer, and the adjustment method further comprises a step of printing said reference density member by said printer.

5 85. The adjustment method according to claim 62, wherein said reference density member has at least a portion of uniform density.

86. A computer program product comprising a
10 computer usable medium having computer readable program code means embodied in said medium for an adjustment method of adjusting image signals in an image sensing apparatus having an image sensor which separately outputs image signals of a plurality of divided areas of
15 a plurality of photoreceptive pixels from a plurality of output terminals respectively corresponding to the plurality of divided areas, a plurality of signal processing units, respectively corresponding to the plurality of divided areas, for applying predetermined
20 signal processing to the image signals output from said output terminals, and a white board, said product including:

first computer readable program code means for scanning said white board by said image sensor and
25 outputting image signals processed by said plurality of signal processing units;

second computer readable program code means for scanning said reference density board by said image sensor and outputting image signals processed by said plurality of signal processing units;

- 5 third computer readable program code means for acquiring adjustment data, for the respective signal processing units, for 1) substantially matching levels of the image signals output from said plurality of signal processing units to a first predetermined level
- 10 when said white board is scanned, 2) substantially matching levels of the image signals output from said plurality of signal processing units to a second predetermined level when said reference density board is scanned, and 3) substantially matching levels of the
- 15 image signals output from said plurality of signal processing units to a level obtained by interpolating between said first and second predetermined levels when an image having a density other than the density of said white board and said reference density board is scanned;
- 20 and

fourth computer readable program code means for adjusting levels of image signals output from said plurality of signal processing units using said adjustment data.